

WHAT IS *ZAMIA PRASINA* (ZAMIACEAE: CYCADALES)?

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ABSTRACT

The name *Zamia prasina* is presently being applied in the horticultural industry and systematic literature to a little known taxon from the Maya Mountains in Belize. An examination of the historical material of *Zamia prasina*, herbarium specimens, and wild *Zamia* populations in Belize leads to the conclusion that the name does not correctly apply to this taxon but instead is a valid prior name for *Zamia polymorpha* that takes nomenclatural precedence. A lectotype for *Z. prasina* is designated.

KEY WORDS: Nomenclature, Priority, Belize, *Zamia prasina*, *Zamia polymorpha*

RESUMEN

El nombre *Zamia prasina* se está aplicando en horticultura y literatura sistemática a un taxón poco conocido de las Montañas Maya de Belize. Un examen del material histórico de *Zamia prasina*, en especímenes de herbario, y poblaciones silvestres de *Zamia* en Belize nos lleva a la conclusión de que no se aplica el nombre correctamente a este taxon, sino que es un nombre previo válido para *Zamia polymorpha* y por lo tanto tiene prioridad nomenclatural. Se designa un lectotipo para *Zamia prasina*.

INTRODUCTION

Zamia prasina Bull was described in 1881 in English nurseryman William Bull's horticultural catalog. Historically, this species has received little mention in the literature, but in recent years the name has been applied in the horticultural industry and systematic literature to a relatively unknown taxon from the Maya Mountains of Belize. We re-examined the historical material related to *Zamia prasina* as well as herbarium specimens and wild *Zamia* populations in Belize in order to uncover the true identity of this species, which is presented in the following analysis.

HISTORICAL MATERIAL AND EARLY USAGE OF THE NAME *ZAMIA PRASINA*

William Bull's 1881 horticultural catalog provided the following description for *Zamia prasina*:

"A handsome and distinct-looking Cycad, introduced from Honduras [referring to British Honduras, now Belize]. The stems in the young plants roundish or roundish-ovate, clothed with the imbricating scales left by the falling of the leaves. The leaves are equally pinnate, the dark green stalks terete, with an indistinct furrow in front, and furnished with a few small white prickles. The leaf-blade is oblong-ovate, pinnate, with some sixteen or seventeen pairs of oblanceolate pinnae, entire, and tapered at the base, where they are set on by a distinctly swollen articulation, denticulate towards the apex, the upper surface of a bright grass-green colour, whence the name. 1 ½ guinea."

Bull also provided a leaf of *Zamia prasina*, which was subsequently mounted as an herbarium specimen at Kew. In a letter attached to this specimen, dated March 22, 1881, he invites William Turner Thiselton-Dyer, at the time Assistant Director at Kew, to stop by his nursery and collect a leaf of *Z. prasina*. Although there was no notation on the specimen indicating when it was collected, it was probably shortly after Thiselton-Dyer received the invitation.

The specimen at Kew was annotated as a possible holotype of *Z. prasina* by Dennis Stevenson of the New York Botanical Garden on September of 1999. However, it has not been designated as a type for the species in any of the printed matter we consulted. This specimen, presumably provided by Bull the same year as he described the species in the horticultural catalog, undoubtedly represents the original material on which the species was based. However, because no reference was made to this specimen in the protologue, it cannot be considered a holotype under article 9.1 of the 2005 International Code of Botanical Nomenclature ("Vienna Code"). We remedy this situation by here designating this specimen as the lectotype for *Z. prasina*.

Zamia prasina Bull, Hort. Cat. 176:20. 1881. TYPE: [BRITISH] HONDURAS [BELIZE]: cultivated from Belize, *William Bull s.n.*, 22 Mar 1881 (LECTOTYPE, here designated: K!).

Zamia polymorpha D.W. Stev., A Moretti & Vázq. Torres, Delpinoa 37–38:3–8. 1998. TYPE: BELIZE. CAYO: 22 Jan 1989, D. Stevenson et al. 1119 (HOLOTYPE: NY; ISOTYPES: BRH, FTG, MO, NY, U).

In addition to this specimen, there is an illustration of a leaf and caudex of *Zamia prasina* at Kew (dated 1881). A letter attached to the illustration (dated June 15, 1881) provides some background on Bull's original importation of *Zamia prasina*. The letter, addressed to "J. Smith Esq." (presumably Kew curator John Smith), mentions that a "Mr. Watson" (presumably Kew assistant curator William Watson) "talked him out of two plants that he did not want to give up." He also mentions receipt of two separate shipments of *Zamia* from Belize and that each of the plants taken by Mr. Watson came from a separate shipment. The first plant, described as having "widely separate" leaflets was the only surviving plant from one of the shipments. The second plant, which Bull called *Z. prasina*, was one of the larger plants from the second shipment of which only a few plants survived. Mr. Bull clearly did not want to let go of the two plants and was asking Mr. Smith to return them. In return, he promised to provide "a couple" of the smaller surviving plants of *Z. prasina* for the collection at Kew. The illustration appears to be traced from the original *Z. prasina* plant provided by Bull before it was returned, as it is on a herbarium-specimen-sized sheet and bears the hand-written words "returned *Zamia prasina*." Another inscription on the illustration reads "cf. *Z. latifolia* Lodd.," and an inscription on the herbarium specimen reads "*Z. latifolia* Lodd." These notes, in the same handwriting, were most likely added by Thiselton-Dyer, as he included *Z. prasina* in his treatment of Mexican and Central American cycads (Thiselton-Dyer 1884) as a synonym of *Z. latifolia* Lodd. ex A.DC (see de Candolle 1868). Thiselton-Dyer added a question mark next to his listing of *Zamia prasina* indicating he was uncertain about its synonymy with *Z. latifolia*. In fact, today it is not entirely clear what *Z. latifolia* is, as it was a horticultural name from Loddiges' catalog for which no type specimen or illustration was provided. Miquel (1843) considered *Zamia latifolia* a synonym of *Z. muricata* var. *obtusifolia*, later bringing it to species rank (1849). In 1847, when he still considered *Z. latifolia* a variety of *Z. muricata*, he published an illustration of a leaflet labeled *Zamia latifoliae* (Linnaea 19(4): Tab. VII, fig. a. 1847), which Stevenson and Sabato (1986) selected as the neotype for *Z. muricata* var. *obtusifolia* (Fig. 1a). Since so little is known about the true identity of what was originally called *Z. latifolia* in Loddiges's catalog, it must be considered a *nomen dubium* as well as its synonym, *Z. muricata* var. *obtusifolia*. Furthermore, the leaflet illustrated in Miquel's publication is unlikely to have been derived from a Belizean species, as none of the known species have leaflets with strongly serrated rounded leaflet tips. The leaflet shape and serrations in Miquel's illustration match closely those of *Z. furfuracea* plants at Montgomery Botanical Center grown from seed collected near Alvarado, Veracruz, Mexico (Fig. 1b).

Thiselton-Dyer clearly considered Bull's specimen to be different than *Z. muricata* Willd., as both species are compared on the *Zamia prasina* illustration in the same handwriting as the "*Z. latifolia*" annotations. The comparison indicates that *Z. prasina* has leaflets that are coriaceous, abruptly acuminate, and serrulate at the apex, whereas *Z. muricata* has leaflets that are chartaceous, gradually acuminate, and spinulose-serrate towards apex. *Zamia muricata* was originally described from Venezuela, and as currently circumscribed, is a species occurring only in Venezuela and Colombia.

In his 1932 cycad treatment, Schuster listed *Z. muricata* var. *obtusifolia* as well as *Zamia prasina* as synonyms of *Z. loddigesii* var. *latifolia* (Lodd.) J. Schust., incorrectly citing the publication date for Bull's horticultural catalog as 1822 rather than 1881 (Schuster 1932).

MODERN USAGE OF THE NAME ZAMIA PRASINA

Since Schuster's synonymization of *Zamia prasina*, the species name received little use until recent years, as apparently the original description and Bull's specimen were misplaced and not re-discovered until 1998 (Whitelock 2002). Since then, the name has been misapplied to a rare and little known taxon from isolated localities in the Maya Mountains of Belize (see Balick et al. 2000; Whitelock 2002; Janovec & Neill 2003; Hill 2004). This species, formally described in this issue (Calonje et al., page 31), differs from *Zamia prasina* in having an epigeous stem, leaflets that are chartaceous, gradually acuminate, with a raised longitudinal

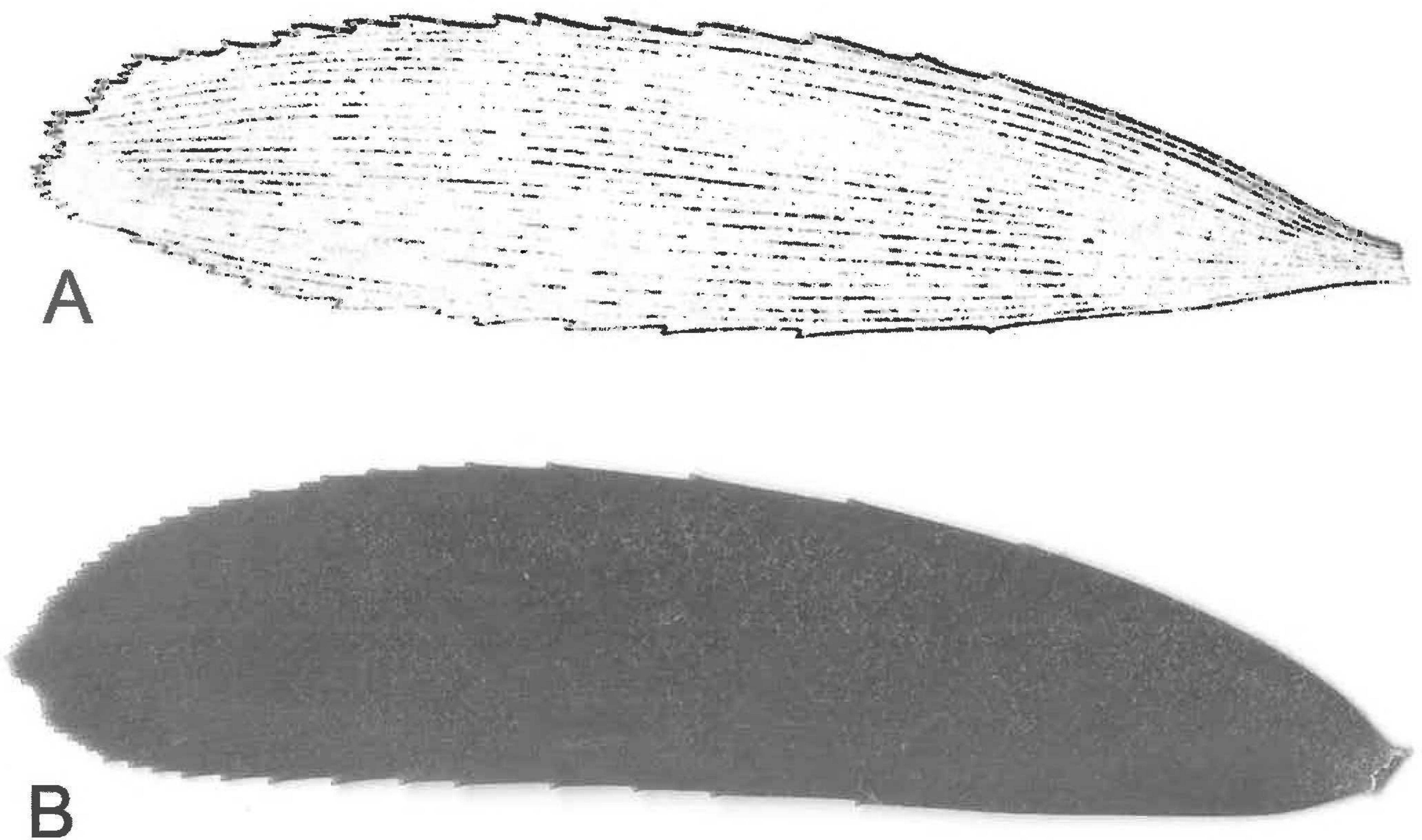


FIG. 1. A. Leaflet of *Zamia muricata* var. *obtusifolia* (= *Zamia latifolia*) illustrated in Miquel (1847), B. Leaflet of *Zamia furfuracea* from plant collected near Alvarado, Veracruz, Mexico (MBC Accession # 20011305*A).

crease, and margins that are entire or with few minute teeth at the apex, rather than a hypogeous stem and leaflets that are coriaceous, abruptly acuminate, without a raised longitudinal crease, and strongly serrulate on the upper half (Fig. 2).

Since it is clear that the plant currently being called *Z. prasina* in horticulture and recent literature does not match the original description, lectotype or illustration of this species at Kew, then the logical ensuing question to ask is: What is *Zamia prasina*?

The only other described *Zamia* species currently known from Belize are *Z. variegata* Warsz. and *Z. polymorpha* D.W. Stev., A. Moretti & Vázquez-Torres. While *Zamia variegata* has strongly serrulate leaflets as described in the protologue for *Z. prasina*, these are papyraceous rather than coriaceous, and are variegated with yellow flecks, a unique and horticulturally appealing character that Bull undoubtedly would have mentioned in his horticultural catalog. However, the coriaceous, strongly serrulate leaflets of *Zamia polymorpha* exactly match the description of *Zamia prasina*.

SYNONYMIZATION OF *ZAMIA POLYMORPHA*

Zamia polymorpha as currently circumscribed ranges from the Yucatan Peninsula in Mexico to Belize (Stevenson et al. 1998). It was previously considered to be a form of *Z. loddigesii* Miq. with a highly variable karyotype (see Vovides & Olivares 1996). Stevenson et al. (1998) noted the karyotype variability as an important characteristic of this species in addition to its high level of polymorphism in leaf and leaflet morphology. This variability was ascribed to phenotypic plasticity due to differences in sun exposure, with plants exposed to full sun having shorter and narrower leaves with lanceolate leaflets, those growing in deeper shade having longer, broader leaves with elliptic to suboblanceolate leaflets, and those growing in intermediate conditions displaying leaf morphologies that are intermediate between the two extremes.

During a cycad research expedition to Belize in August of 2008 sponsored by Montgomery Botanical Center, an extensive survey of populations matching Stevenson et al.'s description of *Z. polymorpha* with strongly serrulate leaflets uncovered some populations with remarkably consistent vegetative morphology, and others that were highly variable. The morphologically consistent populations included narrow-leafleted

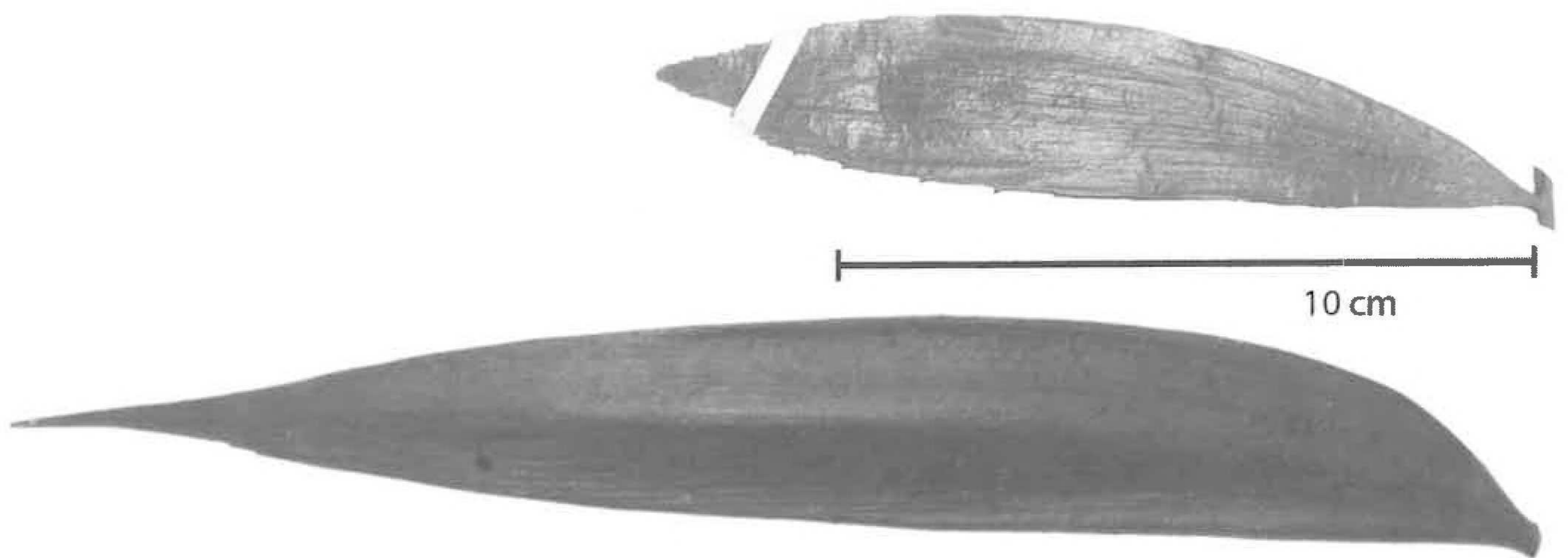


FIG. 2. Same-scale comparison of leaflet of *Zamia prasina* from holotype (above) and leaflet from *Zamia* sp. erroneously referred to as *Z. prasina* (below, Michael Calonje et al. BZ08-201).

plants growing in savannas closely resembling *Zamia loddigesii*, and also other populations growing in tropical evergreen seasonal broad-leaved forests with larger leaves and wider leaflets. In addition to these morphologically consistent populations, others were found to be highly variable, containing the two forms mentioned above as well as intermediate plants.

The variability in these mixed populations appeared to be at least partially genetically determined, as plants with wide leaflets were sometimes found growing in full sun, and some narrow-leaflet plants were found growing in more shaded areas. Plants with narrow leaflets collected in an open savanna by the second author have retained their morphological characteristics despite years of growing in a shaded environment at Green Hills Botanical Collections.

A survey of one highly variable population halfway between Belmopan and Belize City uncovered individual plants closely matching Bull's holotype (Fig. 3) of *Zamia prasina* and the drawing of this species at Kew (Fig. 4), as well as the holotype for *Z. polymorpha* (Fig. 5), indicating that *Z. prasina* and *Z. polymorpha* are the same species, and therefore *Z. prasina* takes nomenclatural precedence over *Z. polymorpha*.

In addition, there is also some circumstantial evidence suggesting that *Z. prasina* is a prior valid name for the species now considered *Z. polymorpha*. William Bull did not provide a locality or specific habitat information for where in Belize *Z. prasina* may have been collected, but two years after its description, Morris (1883) identified plants common on ridges and banks near Point Ycacos as belonging to this species. Morris did not provide a description or illustration of the plants he saw, but the cycad that is common in this area, visited by the second author, matches the description of *Zamia polymorpha*. Furthermore, this species is the most common cycad throughout Belize and would very likely be the first species encountered by collectors for William Bull.

Zamia prasina (now including *Z. polymorpha*) appears to belong to a species complex that includes *Z. loddigesii* and other related species such as *Z. paucijuga* Wieland, and *Z. spartea* A. DC (Schutzman 1987). Members of this species complex display high levels of morphological variation (Gonzalez-Astorga et al. 2006) and may easily hybridize (Schutzman 1987). Although Schuster's (1932) taxonomic work with cycads is not highly regarded (see Stevenson & Sabato 1986; De Luca 1990; Taylor et al. 2008), his inclusion of *Z. prasina* as a synonym of *Z. loddigesii* suggests that the name at the time may have been applied to plants within this species complex.

The differential morphological variability observed within populations of *Zamia prasina*, coupled with the high morphological variability between populations and the variable karyotypes reported by Stevenson and Sabato (1986), indicate that while it is possible that populations with subterranean stems and coriaceous, serrulate leaflets represent one highly polymorphic species, further research including genetic sampling



FIG. 3. Same-scale comparison of *Zamia prasina* lectotype (right) and specimen collected between Belmopan and Belize City (left, Michael Calonje et al. BZ08-086).

across a wide range of populations will be needed to better clarify the relationship between the different forms and their placement within the *Zamia loddigesii* species complex. Until species limits are clarified we recommend continued recognition of *Zamia prasina* (with *Z. polymorpha* included within its circumscription).

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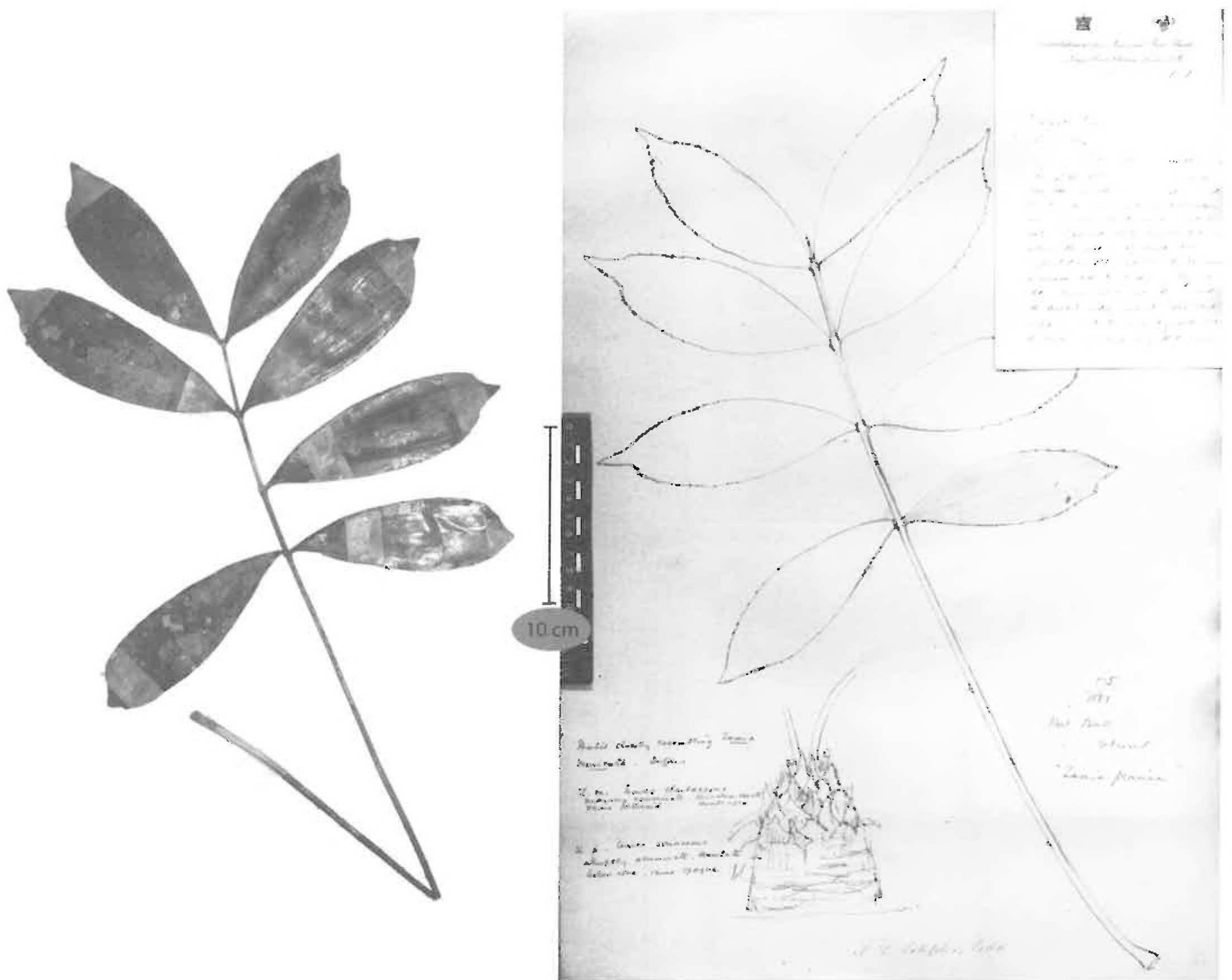


FIG. 4. Same-scale comparison of *Zamia prasina* drawing at Kew made from plant supplied by William Bull (right) and specimen collected between Belmopan and Belize City (left, Michael Calonje et. al BZ08-073)

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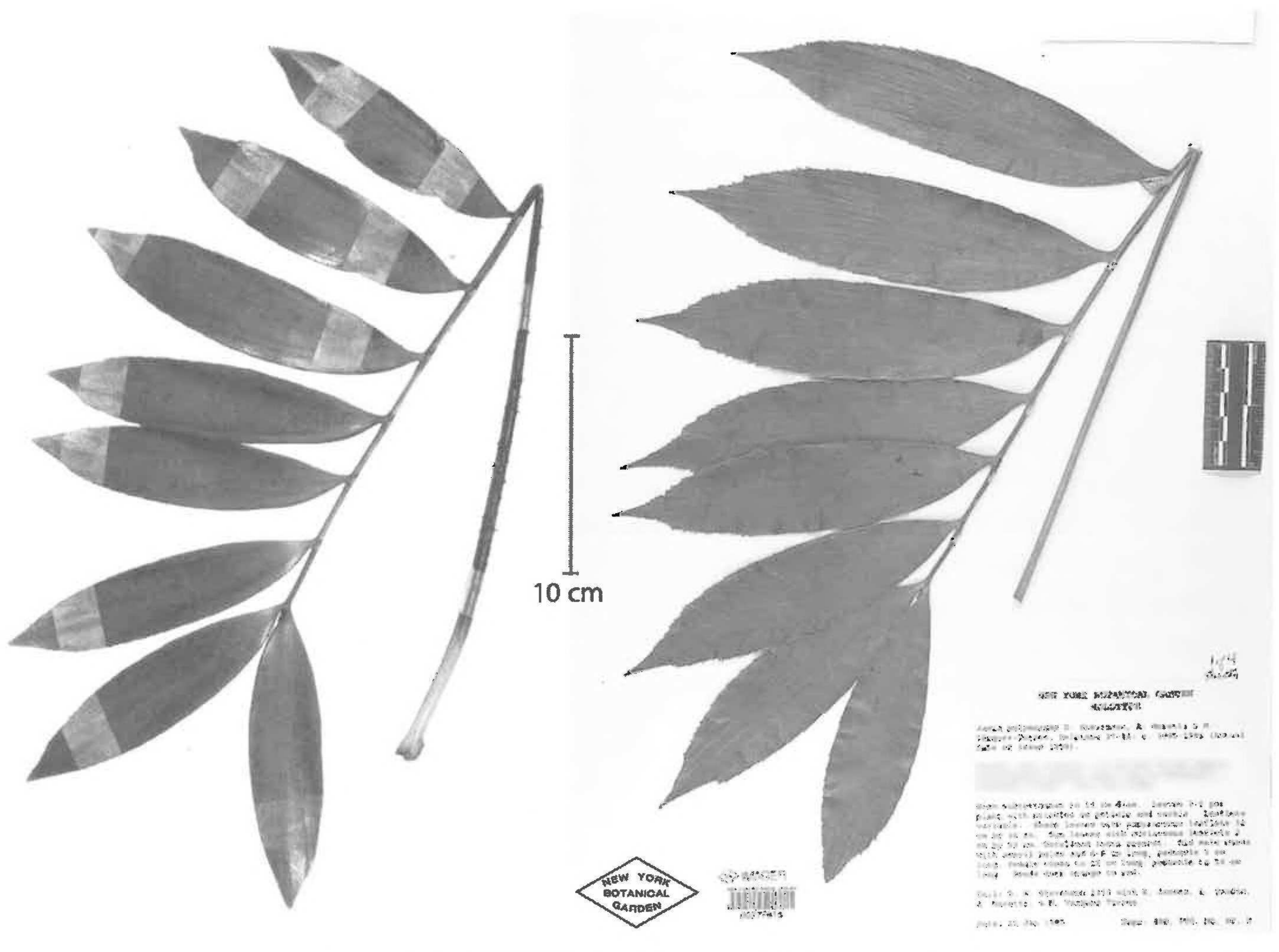


Fig. 5. Same-scale comparison of *Zamia polymorpha* holotype (right) and specimen collected near between Belmopan and Belize City (left, Michael Calonje et. al BZ08-085). Image of *Zamia polymorpha* holotype used with permission from The C.V. Starr Virtual Herbarium of the New York Botanical Garden (<http://sciweb.nybg.org/science2/VirtualHerbarium.asp>). Locality data intentionally obscured.

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